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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/957,395	09/19/2001	Anisul Khan	AM5782	4481

32588 7590 06/27/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 06/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/957,395

Applicant(s)

KHAN ET AL.

Examiner

Roberts Culbert

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Japanese Patent JP 05224055 A. Referred to afterwards as the '005 Patent.

Referring to figures 1-3, the '005 Patent teaches a method of making an optical wave-guide in a substrate material comprising forming an opening in said substrate (figure 1c), depositing a first cladding layer conformally in the opening (figure 1d), filling the opening with a core material (figures 1e and 2f), and depositing a second cladding layer over the substrate (figures 1f-1g, and 3h-3i).

Regarding claims 2 and 3, the '005 Patent teaches a silicon substrate (See paragraph 11 of attached translation).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent JP 05224055 A in view of U.S. Patent 6,553,170 to Zhong.

As applied above, the '005 Patent discloses the method of the invention substantially as claimed, but does not teach that the cladding layers have a different refractive index.

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However, it is well known in the art of wave-guide fabrication to form top, bottom and core layers of a wave-guide each having a different refractive index. Commonly the core layer has a higher refractive index than the cladding layers as this aids in signal transmission. Also the top and bottom cladding layers are typically close to the same index of refraction, however, they do not have to be exactly the same as shown by Zhong. Zhong teaches that it is old in the art to form a wave-guide in which the bottom cladding is different from the upper cladding. See Background of the Invention (Col. 2, Lines 1-3). Note that the top clad is made from BPSG and the bottom clad is SiO₂ silica. One of ordinary skill in the art would have recognized that these different materials each have a different refractive index. Note also the invention of Zhong teaches a method of forming a wave-guide having top and bottom cladding layers each with a different refractive index. The top clad (411) is Boron doped, and the bottom clad (412) is SiO₂ (Col. 5, Lines 3-5). It would have been obvious to one of ordinary skill in the art at the time of invention to form the cladding layers each with a different refractive index in order to improve the re-flow characteristics of the top clad layer and thereby improve the gap-filling properties of the top clad as taught by Zhong (Col. 2, Lines 55-61).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent JP 05224055 A in view of U.S. Patent 6,282,358 to Hornbeck.

As applied above, the '005 Patent discloses the method of the invention substantially as claimed, but does not teach the use of chemical mechanical polishing to remove the excess core material. However, the '005 Patent teaches that other methods known in the art are equivalent to the etch-back process used.

Hornbeck teaches a method for forming a wave-guide in a trench including removing the excess core material by chemical mechanical polishing (Col. 7, Lines 40-65). It would have been obvious to one of ordinary skill in the art at the time of invention to use CMP to remove the excess core material in order to form a substantially planar surface for the core as it is well known in the art that a smooth core material reduces light-signal transmission losses in the wave-guide.

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Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent JP 05224055 A in view of the publication to Wolf, silicon processing for the VLSI era pages 191-192 and 219-220 and in further view of U.S. Patent 5,877,065 to Yallup.

As applied above, the '005 Patent discloses the method of the invention substantially as claimed, but does not teach the use of a hard-mask to form the wave-guide trench.

Wolf teaches that it is known in the semiconductor art to use a hard-mask of silicon nitride and silicon oxide for the selective oxidation of Si. It would have been obvious to one of ordinary skill in the art to form a hard-mask on the silicon surface by depositing a silicon nitride layer and a silicon oxide layer in order to provide mechanical protection, and diffusion protection (passivation) with less likelihood of delaminating or cracking. The silicon nitride protects the underlying Si from oxidizing, while allowing a thermal SiO₂ layer to grow on regions of exposed Si. (See page 192 lines 5-6).

Yallup provides a further example of and motivation for the use of a hard-mask to form the trench in the invention of the '005 patent. Yallup teaches a method of making an isolation trench in a silicon substrate material comprising forming a hard-mask (30) on a substrate (10) forming an opening in said substrate (figure 3), depositing a first cladding layer conformally in the opening (figure 4), filling the opening with a core material (figure 4), and depositing a second cladding layer over the substrate (figure 7). Yallup teaches that it is known in the prior art to form a trench in a (SOI) substrate using a hard-mask (30). The hard-mask is removed prior to the deposition of the top oxide layer (18).

Regarding claim 8, Yallup also teaches the use of a SOI substrate. It would have been obvious to one of ordinary skill in the art at the time of invention to use the SOI substrate in order to provide an etch-stop for the trench formation process as described in Yallup (Col. 3, Lines 7-10).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: U.S. Patents 5,281,305; 5,431,775; 5,445,988; 5,604,835; 5,863,827 and 6,324,204; German Patent DE 100 15 830 A1.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

R. Culbert



June 24, 2003



GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700